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United States
Department of
Agriculture

Forest
Service

Forest
Products
Laboratory

Dividends From Wood Research

Recent Publications

July–December 1988

Explanation and Instructions

"Dividends From Wood Research" is a semiannual listing of recent publications resulting from wood utilization research at the Forest Products Laboratory (FPL). These publications are produced to encourage and facilitate application of Forest Service research. This issue lists publications received from the printer by the FPL Publications Section between July 1, 1988, and December 31, 1988.

Each publication listed in this brochure is available through at least one of the sources below. For each entry in the brochure, we indicate the primary source for that publication and show you how to obtain a copy:

Available from FPL (indicated by an order number before the title of the publication): Quantities limited. Circle the order number on the blank at the end of the brochure and mail the blank to FPL.

Available through sales outlets (indicated by the name of the outlet and, when available, price information): Major sales outlets are the Superintendent of Documents, the National Technical Information Service (NTIS), and various private publishers. Order directly from the outlet.

Available through libraries: Research publications are available through many public and university libraries in the United States and elsewhere. U.S. Government publications are also available through many Government Depository Libraries. Check with a major library near you to determine availability.

List of Categories

Publications are listed in this brochure within the following general categories:

- Biodeterioration and protection
- Engineering properties and design criteria
- Fire safety
- General
- Microbial and biochemical technology
- Mycology
- Processing of wood products
- Pulp, paper, and packaging
- Structural fiber and particle products
- Timber requirements and economics
- Wood bonding systems
- Special items

Biodeterioration and Protection

Resistance of Hardwood Vessels to Degradation by White Rot Basidiomycetes

Blanchette, Robert A.; Obst, John R.; Hedges, John I.; Weliky, Karen
Can. J. Bot. 66(9): 1841–1847; 1988.

Available from Robert A. Blanchette, Department of Plant Pathology, University of Minnesota, St. Paul, MN 55108, U.S.A. No charge.

This paper reports an unusual decay pattern that occurs in white-rotted wood with a white stringy appearance. It identifies several factors responsible for resistance of hardwood vessels to degradation and examines a white pocket rot in *Acacia koa* var. *koa* Gray where large vessel elements are relatively unchanged.

1. Case Studies of Utility Poles in the Tropics: II. Saipan and Hawaii

DeGroot, Rodney C.
The Malaysian Forester. 49(2): 127–150; 1986.

The Forest Products Laboratory conducted field investigations in the Tropics to determine whether minimum requirements of wood preservation standards used in the United States insure adequate protection from termites and decay fungi in that environment. This is a report on the durability of preservative-treated utility poles, of U.S. origin, used in Saipan and in Hawaii.

2. Resistance of Chemically Modified Wood to Marine Borers

Johnson, Bruce R.; Rowell, Roger M.
Mater. Org. 23(2): 147–156; 1988.

Since the chemical and physical properties of wood depend upon the chemical composition of the cell wall, it is possible to change wood properties by chemically modifying the cell wall polymers. For this study, we reacted Southern Pine with propylene or butylene oxides, butyl isocyanate, or acetic anhydride, all of which had imparted some resistance to decay by brown- and white-rot fungi and termites in earlier laboratory tests.

Fungal Resistance of Pine Particle Boards Made From Various Types of Acetylated Chips

Nilsson, Thomas; Rowell, Roger M.; Simonson, Rune; Tillman, Anne-Marie
Holzforschung. 42(2): 123–126; 1988.

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Available from Rune Simonson, Department of Engineering ChemistryII, Chalmers University of Technology, S–412 96, Gothenburg, Sweden. Cost: unknown.

The purpose of this research was twofold: (1) to determine if the standard fungus cellar test used for solid wood blocks could be used directly on particleboards made with melamine–urea-formaldehyde adhesive, without the adhesive having a toxic effect on the soil micro-organisms; and (2) to then use the fungus cellar test to evaluate the rot resistance of particleboards made from different types of acetylated chips.

Spectroscopic Analysis of Southern Pine Treated With Chromated Copper Arsenate. I. X-Ray Photoelectron Spectroscopy (XPS)

Ostmeyer, Jeffrey G.; Elder, Thomas J.; Littrell, Donald M.; Tatarchuk, Bruce J.; Winandy, Jerrold E.
J. Wood Chem. Technol. 8(3): 413–439; 1988.

Available from Thomas J. Elder, School of Forestry and Alabama Agricultural Experiment Station, Auburn University, Auburn, AL 36849. No charge.

This paper describes several nondestructive, solid-state, spectroscopic techniques to elucidate the nature of wood–CCA complexes in their original place, in an attempt to understand the influence of CCA treatment on the mechanical properties of Southern Pine lumber.

3. Biocontrol of Decay or Pathogenic Fungi in Wood and Trees

Ricard, Jacques; Highley, Terry L.
In: Gear, Alan, ed. Trichoderm Newsletter No. 4; 2d International *Trichoderma/Gliocladium* workshop; 1987; Salford, UK. Coventry, UK: Henry Doubleday Research Association; 1988: 9–15.

This paper reviews the obstacles hindering the use of biocontrol fungicides in wood and trees and discusses expanding opportunities for such use.

4. Wood Modification in the Protection of Wood Composites

Rowell, Roger M.; Esenther, Glenn R.; Youngquist, John A.; Nicholas, Darrel D.; Nilsson, Thomas; Imamura, Yuji; Kerner-Gang, Waltrant; Trong, Lucien; Deon, Gerard
In: Proceedings, IUFRO division 5 forest products subject group S.5.03: Wood protection; 1987 May 16–17; Honey Harbour, Ontario, Canada; 1988: 239–266.

The purpose of this research was to acetylate aspen flakes, use them to make flakeboards, and test both control and acetylated flakeboards in a variety of biological tests. The biological tests were conducted by a nine-person team in seven different laboratories in six countries. They consisted of termite tests, weight loss tests with brown- and white-rot fungi, fungal cellar tests with brown-, white-, and soft-rot fungi and tunneling bacteria, and strength loss tests with brown- and white-rot fungi.

5. Performance of Finishes on Wood Modified With Chromium Nitrate Versus Chromic Acid

Williams, R.S.; Feist, W.C.
Forest Prod. J. 38(11/12): 32–35; 1988.

The efficacy of chromium nitrate pretreatment of wood for extending the service life of stains and clear coatings is reported.

Engineering Properties and Design Criteria

6. Effect of Slope of Grain on Tensile Strength

Gerhards, C.C.
Forest Prod. J. 38(7/8): 39–40; 1988.

Small, clear wood specimens of Douglas-fir with grain angles from 1 to 16.5° were tested for tensile strength. The tensile strength slope-of-grain data were characterized by a Hankinson-type formula. The data show the expected trend of decreasing strength with increasing grain angle.

7. A Note on Load Duration of Douglas-fir 2 by 4s Under Repeated Loads

Gerhards, C.C.
Wood Fiber Sci. 20(3): 365–369; 1988.

This paper evaluates the effect of repeated loads on load duration of Douglas-fir 2 by 4 beams. The results for repeated bending loads considered only qualitatively simulate real loads and are of slow cycle, rather than the fast cycle used in fatigue testing.

8. Moisture Content and the Shrinkage of Lumber

Green, David W.
USDA Forest Serv. Res. Pap. FPL–RP–489; 1989. 11 p.

The basis for the shrinkage factors given in the American Softwood Lumber Standard, PS 20–70, is reviewed. Using the PS 20–70 recommendations and previous research on the shrinkage of Douglas-fir and redwood 2-in. dimension lumber, equations are derived for calculating the shrinkage of lumber as a function of moisture content.

9. Structural Composites Under Long-Term Loads

Laufenberg, Theodore L.
In: Hamel, Margaret P., ed. Structural wood composites: new technologies for expanding markets: Proceedings 47359; 1987 November 18–20; Memphis, TN. Madison, WI: Forest Prod. Res. Soc.; 1988: 67–71.

This paper provides a background of information on the creep–rupture phenomenon by describing the microscopic mechanisms presumed to control the process. It also gives the history of the Forest Products Laboratory's treatment of creep–rupture in design of wood structures, the models commonly used to describe the creep–rupture time-to-failure behavior, and an overview of the literature for structural particleboards, flakeboards, and plywood.

10. Statistical Considerations in Duration of Load Research

Link, Carol L.
USDA Forest Serv. Res. Pap. FPL–RP–487; 1988.
20 p.

Duration of load factors are the most significant factors that reduce allowable design stresses for lumber. This report discusses statistical considerations for the design of duration of load tests and for analysis of the resulting data. Duration of load factors along with their associated confidence intervals are estimated for one model using Douglas-fir data from tests at the Forest Products Laboratory.

11. Tensile Strength of Laminating Grades of Lumber

Marx, Catherine M.; Evans, James W.
Forest Prod. J. 38(7/8): 6–14; 1988.

This paper provides tensile strength distributional characteristics, including three-parameter Weibull distributional estimates, for four Douglas Fir/Larch and three Southern Pine laminating grades. A total of 1,345 "on-grade" 2 by 6's, 12 feet long, were tested in tension parallel to grain.

12. Variation in Stiffness of Horizontally Laminated Glulam Timber Beams

Moody, Russell C.; De Sousa, Pedro P.; Little, J. Kevin
Forest Prod. J. 38(10):39–45; 1988.

The purpose of this research was to develop and evaluate an analytical model to estimate the variation in modulus of elasticity of horizontally laminated beams. Two typical design combinations, one of visually graded Douglas Fir/Larch and the other of visually graded Southern Pine, are examined in detail.

13. Mode II Wood Test Specimen: Beam With Center Slit

Murphy, J.F.
J. Test. Eval., JTEVA 16(4):364–368; July 1988.

There is no standard test method to measure stress intensity for wood. The objective of this study was to demonstrate a crack propagation equation and test specimen to measure stress intensity for wood. The effect of a sharp crack compared to a sawn crack is also explored. This paper presents theoretical analysis and experimental evaluation of a center-slit test specimen for wood.

14. Behavior of Metal-Plate Connected Joints in Creosote Treated Wood: A Pilot Study

Oliva, M.G.; Krahn, L.; McCarthy, M.; Ritter, M.
Forest Prod. J. 38(7/8): 76–80; 1988.

The results of this pilot study indicated that the use of metal connector plates in creosote-treated wood may be feasible. Also, additional comprehensive studies should be undertaken to determine quantitative effects as well as the corrosion resistance of the plate in environmental conditions or when subjected to road salts.

15. Duration of Load on Bolted Joints: A Pilot Study

Wilkinson, Thomas Lee
USDA Forest Serv. Res. Pap. FPL–RP–488, 1988.
9 p.

This report describes an initial effort to determine the time effects of load on bolted joints. The study was limited to one species, one bolt diameter, and one joint geometry, as it was intended as an initial effort for determining the need for additional studies.

16. The Effects of CCA Preservative Treatment and Redrying on the Bending Properties of 2 x 6 Southern Pine Lumber

Winandy, J.E.; Boone, R.S.
Wood Fiber Sci. 20(3): 350–364; 1988.

The primary objective of this study was to define the distributional characteristics of lumber bending properties and allowable design stresses throughout the entire bending strength distribution for 2 by 6 Southern Pine lumber.

17. Combined-Load Stability Criterion for Wood Beam–Columns

Zahn, John J.
J. Struct. Eng. 114(11): 2612–2628; 1988.

In this paper an elastic buckling criterion is derived for the case of simply supported members under any combination of strong-axis bending loads, weak-axis bending loads, axial compression, equal end couples, and water ponding.

Fiber and Particle Products

18. Delamination Rate of Acrylic-Latex-Finished Urea-Bonded Particleboard in Short-Term Exterior Exposure

Carll, Charles G.
USDA Forest Serv. Res. Note FPL–RN–0255; 1988.
7 p.

The study was undertaken to identify if acrylic-latex finishing systems, which are relatively easy to apply and remain extensible but are also relatively water-permeable, are capable of protecting commercial urea-bonded particleboards from early delamination in exterior exposure.

19. Direct Withdrawal and Head Pull-Through Performance of Nails and Staples in Structural Wood-Based Panel Materials

Chow, Poo; McNatt, J. Dobbin; Lambrechts, Steven J.; Gertner, George Z.
Forest Prod. J. 38(6): 19–25; 1988.

This research developed data on the maximum direct nail and staple withdrawal and the pull-through performance of nine commercial structural wood-based sheathing and siding panels when compared to conventional plywood sheathing material. This paper also determines the effects

of severe exposure on the nail and staple performance by conducting accelerated-aging tests.

20. Combined Board Properties of FPL Spaceboard Formed by a New Method

Hunt, John F.; Scott, C. Tim
Tappi J. 71(11): 137–141; 1988.

An improved forming method for spaceboard is described. This paper gives a comparison of the edgewise compression strength of spaceboard formed by this improved method to spaceboard formed by the previous method, and evaluates the properties of spaceboard formed by this improved method.

21. Chemical Modification: Adding Value Through New FPL Composite Processing Technology

Rowell, Roger M.; Youngquist, John A.; Montrey, H.M.
Forest Prod. J. 38(7/8): 67–70; 1988.

This paper is an overview of chemical modification research completed or planned at the Forest Products Laboratory. Specifically, this paper describes the most promising results from chemical modification technology studies to date; reviews what has been demonstrated with solid wood; points out the potential that exists for applying this technology to reconstituted furnish; outlines future research to demonstrate the technical and economic feasibility of producing chemically modified composite products; and develops an argument for focusing future research on thick, exterior fiber products.

22. Wood-Based Composites: The Panel and Building Components of the Future

Youngquist, John A.
In: Proceedings, IUFRO division 5 forest products subject group S.5.03: Wood protection; 1987 May 16–17; Honey Harbour, Ontario, Canada; 1988: 5–22.

This paper provides an overview of structural composite products and provides definitions of composite materials. It also discusses critical properties, mentions standards and codes that are in existence for some composite products, and discusses adhesive bonding, a factor critical to all wood-based composite products.

Fire Safety

Reliability Analysis of Wood-Frame Wall Assemblies Exposed to Fire

Gammon, Barry Wayne
Ph.D., University of California, Berkeley, 1987.
392 p. Dissertation Abstracts International 48(9); March 1988.

Available from University Microfilms International, 300 North Zeeb Road, Ann Arbor, MI 48106. Order No. DA8726210. Cost: $20.

This study demonstrated that computer simulations of wood-frame wall assemblies exposed to fire could be used to generate the fire resistance data necessary for reliability analysis. However, more research is needed on the thermal properties of wall materials.

23. Quantification of Smoke Generated From Wood in the NBS Smoke Chamber

Tran, Hao C.
J. Fire Sci. 6: 163–180; May/June 1988.

A smoke density chamber was used to study dynamic smoke generation from wood. Solid red oak and Douglas-fir plywood were tested at three levels of heat flux under nonflaming exposure. Smoke particulate concentrations were obtained using a filtration method.

24. Analytical Methods for Determining Fire Resistance of Timber Members

White, Robert H.
SFPE handbook of fire protection engineering.
Quincy, MA: National Fire Protection Assoc.; 1988: 3-130–3-142. Chapter 8.

This paper reviews the methods available for determining the contribution of the performance of the protective membrane of a wood member, the extent of charring of the structural wood element, and the load-carrying capacity of the remaining uncharred portions of the structural wood elements. It also discusses the major properties of wood that affect the thermal and structural response of wood assemblies or components.

General

25. Diterpene Resin Acids of *Pinus koraiensis* Needles, Cortex and Xylem

Han, James S.; Hwang, Byung-Ho
J. Korean Wood Sci. Technol. 16(2): 62–68; 1988.

This study reports a systematic comparison of the composition of the resin acids from the three nonconnecting resin systems of the xylem, cortex, and needles. The information will provide a foundation for chemotaxonomic, genetic, and insect studies.

26. Research Needs in Wood Physics: A Broad Overview

James, William L.
Wood Fiber Sci. 20(2): 277–294; 1988.

This compilation will help individual scientists formulate research projects and programs responsive to recognized needs in wood physics. It may serve also as a vehicle for cooperative research projects between individuals or between institutions.

27. Contact Angle Measurement of Wood Using Videotape Technique

Kalnins, M.A.; Katzenberger, C.; Schmieding, S.A.; Brooks, J.K.
J. Colloid and Interface Sci. 125(1): 344–346; 1988.

Direct determination of the contact angle on solid surfaces is difficult when the angle soon starts to change because

of interaction between the solid and liquid. Such is the case with wood and water. This paper describes a videotape technique allowing unhurried measurement of the contact angle at any desired elapsed time. This procedure may be useful for contact angle measurements on other materials as well.

28. The Quantity and Type of Lignin in Tyloses of Bur Oak (*Quercus macrocarpa*)

Obst, John R.; Sachs, Irving B.; Kuster, Thomas A.
Holzforschung. 42(4): 229–231; 1988.

Although tyloses have been shown to contain lignin, most studies have been qualitative, employing lignin stains or ultraviolet absorption. Determination of lignin as the acid-insoluble residue may lead to erroneous results if a significant amount of contaminating polyphenolics, resins, protein, or other extraneous materials is present. This study reports the results of the limited characterization of the lignin in isolated bur oak tyloses and ray cells.

29. Moisture Damage in Manufactured Homes in Wisconsin

TenWolde, Anton
In: Shuman, Everett C.; Achenbach, Paul R., eds. Building thermal envelope technology series. Washington, DC: Building Thermal Envelope Coordinating Council. 1: 87–103; 1988.

In mid-July 1986, reports of severe moisture damage in walls of manufactured housing in northern Wisconsin surfaced. A State task force investigated the damage and issued recommendations for repair and future prevention. The task force concluded that the damage was usually caused by condensation caused by excessively high indoor humidities during winter. The excessive humidity was primarily the result of a combination of low ventilation rates during winter and a relatively high occupancy rate. The task force issued a report with recommendations for additional ventilation, moisture source control, and repair of the structural damage. This paper summarizes that report.

Microbial and Biochemical Technology

30. Continuous Xylose Fermentation by *Candida shehatae* in a Two-Stage Reactor

Alexander, M.A.; Chapman, T.W.; Jeffries, T.W.
In: Scott, Charles D., ed. Proceedings, 9th symposium on biotechnology for fuels and chemicals; 1987 May 5-8; Boulder, CO. In: Applied Biochemistry and Biotechnology. Clifton, NJ: Humana Press 17: 221–229; 1988.

Recent work has identified ethanol toxicity as a major factor preventing continuous production of ethanol at the concentrations obtainable in batch culture. This paper investigates the use of a continuous two-stage bioreactor design to circumvent toxic effects of ethanol.

31. Xylose Metabolism by *Candida shehatae* in Continuous Culture

Alexander, M.A.; Chapman, T.W.; Jeffries, T.W.
Appl. Microbiol. Biotechnol. 28: 478–486; 1988.

Two sets of data are presented in this paper: (1) the responses of cultures to shifts from one aeration regime to another (e.g., fully aerobic to semi-aerobic conditions); and (2) data from the steady-state conditions existing before and after such shifts.

32. Levels of Pentose Phosphate Pathway Enzymes From *Candida shehatae* Grown in Continuous Culture

Alexander, M.A.; Yang, V.W.; Jeffries, T.W.
Appl. Microbiol. Biotechnol. 29: 282–288; 1988.

This research examines the titers of key enzymes in cells grown under well-defined culture conditions that would affect their physiology. Four important variables that may affect enzyme titers were examined in continuous culture: dilution rate, temperature, aeration condition (fully aerobic, semi-aerobic, or anaerobic), and carbon source (xylose compared to glucose).

33. Ligninase-Mediated Phenoxy Radical Formation and Polymerization Unaffected by Cellobiose:Quinone Oxidoreductase

Odier, Etienne; Mozuch, Michael D.; Kalyanaraman, B.; Kirk, T. Kent
Biochimie. 70: 847–852; 1988.

The purposes of this investigation were to determine whether, as suspected, ligninase oxidation of a phenol leads to phenoxy radical formation, and, if so, to determine directly whether cellobiose:quinone oxidoreductase (CBQase) + cellobiose affects radical stability; and whether the ligninase polymerization of a representative phenolic substrate and lignin is prevented by CBQase + cellobiose. The authors also examined the effect of glucose oxidase (GOD) on phenoxy radical stability, following recent speculation that GOD also reduces the radicals.

34. Nucleotide Sequence of a Ligninase Gene From *Phanerochaete chrysosporium*

Smith, Timothy L.; Schalch, Heidi; Gaskell, Jill; Covert, Sarah; Cullen, Daniel
Nucleic Acids Res. 16(3): 1219; 1988.

Lignin biodegradation is catalyzed in part by ligninases, also known as lignin peroxidases. This paper gives the nucleotide sequence of the gene encoding ligninase isozyme H8 from the white-rot fungus *Phanerochaete chrysosporium*.

Mycology

35. Cellulolytic Activity of Brown-Rot and White-Rot Fungi on Solid Media

Highley, Terry L.
Holzforschung. 42(4): 211–216; 1988.

By studying a number of white- and brown-rot fungi on dyed cellulose over an agar medium, the author wished to determine (1) the capacity of both types of decay fungi to solubilize dyed microcrystalline cellulose, (2) the effect of a "starter" sugar on the solubilization of dyed cellulose, (3) the variation among isolates of the brown-rotters, *Postia placenta*, *Gloeophyllum trabeum*, and *Gloeophyllum saepiarium*, in solubilization of dyed cellulose, and (4) the relation of the ability to solubilize dyed cellulose to the ability to decompose isolated cotton cellulose.

36. Antagonism of *Trichoderma* spp. and *Gliocladium virens* Against Wood Decay Fungi

Highley, Terry L.; Ricard, Jacques
Mater. Org. 23(3): 157–169; 1988.

This paper determines the antagonistic ability of *Gliocladium virens* and various *Trichoderma* spp. against important white- and brown-rot fungi by testing their ability to (1) inhibit growth and overgrow colonies of the decay fungi in a malt-agar medium, and (2) prevent decay and eradicate decay fungi in wood blocks, with or without added nutrients.

37. The Status of *Meripilus giganteus* (Aphyllophorales, Polyporaceae) in North America

Larsen, Michael J.; Lombard, Frances F.
Mycologia. 80(5): 612–621; 1988.

This communication reviews the existing evidence for the identity of the fungus *Meripilus giganteus* (Pers.:Fr.) Karst., its occurrence in North America, and its relationship to the closely allied species represented by the names *Grifola sumstinei* Murr. and *G. lentifrondosa* Murr.

38. *Scytinostroma galactinum* Species Complex in the United States

Nakasone, K.K.; Micales, J.A.
Mycologia. 80(4): 546–559; 1988.

This study resolves the *S. galactinum* species complex in North America and provides detailed basidiocarp and cultural descriptions of the taxa involved. In addition, isozymes are analyzed to explore the genetic relationships within the *S. galactinum* species complex.

Deuteromycotina and Selected Ascomycotina From Wood and Wood Products

Stewart, Elwin L.; Palm, Mary E.; Burdsall, Harold H., Jr.
St. Paul, MN: MPPD Pleomorphic Press; 1988. 284 p.

Available from Mycology Herbarium, Department of Plant Pathology, 495 Borlaug Hall, 1991 Buford Circle, University of Minnesota, St. Paul, MN, 55108. Cost: $20.

This book is composed of an Index to Taxa, Substrate Index, Subject Index, Author Index, General Bibliography, and Guide to Taxonomic Literature. The book is intended to facilitate retrieval of published information on fungi from wood and wood products, especially soft rot fungi. The importance of Deuteromycotina, and certain Ascomycotina, in reducing the value of wood and wood products has gained recognition over the past 25 years. Many of these organisms cause a soft rot of wood and wood products; others discolor wood or otherwise reduce its market value. The literature dealing with this subject is voluminous and scattered in journals and other references on a worldwide basis. For this reason an indexed bibliography was published in 1979. This book contains the references included in the original bibliography as well as relevant literature published since 1979. Additionally, references that provide a means for entry into the taxonomic literature of these fungi are listed in a separate section.

Processing of Wood Products

39. A Continuous Press Dryer for Veneer

Loehnertz, Stephen P.
Forest Prod. J. 38(9): 61–63; 1988.

This research determined the technical feasibility of continuous press drying of veneer; the economic feasibility was not explored. Heebink previously studied this concept in 1962. This paper reports what he learned and develops the concept into a practical process.

40. Saw–Dry–Rip Improves Quality of Random-Length Yellow-Poplar 2 by 4's

Maeglin, Robert R.; Boone, R. Sidney
USDA Forest Serv. Res. Pap. FPL–RP–490; 1988.
15 p.

This study evaluates the Saw–Dry–Rip (SDR) process for manufacturing random-length 2 by 4's up to 16 ft in length. Warp and yield of SDR-processed lumber are compared to that of conventionally processed lumber.

41. Press-Drying Plantation-Grown Loblolly Pine 2 by 4's to Reduce Warp

Simpson, William T.; Danielson, Jeanne D.; Boone, R. Sidney
Forest Prod. J. 38(11/12): 41–48; 1988.

This study shows that crook, bow, and twist can be significantly reduced in fast-grown plantation loblolly pine 2 by 4's by press-drying instead of kiln-drying.

Pulp, Paper, and Packaging

42. Selection of White-Rot Fungi for Biopulping

Blanchette, Robert A.; Burnes, Todd A.
Biomass. 15: 93–101; 1988.

This paper describes the results from selection studies where several white-rot fungi were screened for potential industrial use. The paper also examines the

diversity among different strains of fungi and evaluates several white-rotters on different deciduous and coniferous woods.

43. Hexamethyldisilazane Treatment to Restore Strength of Recycled Fiber

Sachs, Irving B.
Wood Fiber Sci. 20(3): 336–343; 1988.

This paper demonstrates that hexamethyldisilazane treatment can be used to increase strength of recycled corrugated fiberboard, and shows the presence of raised fibrils and microfibrils on fiber surfaces by use of scanning electron microscopy.

44. Tensile Straining of Pulp Fibres and Fibre Network

Sachs, Irving B.
Pap. Technol. Ind. 29(3): 101–104; 1988.

Because of the limited amount of information, this study investigated the tensile-straining behavior of fibres within fibre networks as well as individual dry pulp fibres. To provide for simultaneous microscopical observation of tensile-strained fibres—within fibre networks or as individual fibres—a simple testing device was built and used in conjunction with a light microscope, television camera, and monitor. Softwood and hardwood kraft pulp fibres and alpha cellulose fibres were tensile strained to failure, while deformation and changes in the cell walls were recorded. Observations were made on individual fibres as well as individual fibres within fibre networks.

Timber Requirements and Economics

45. Investment Opportunity: The FPL Low-Cost Solar Dry Kiln

Harpole, George B.
USDA Forest Serv. Gen. Tech. Rep. FPL–GTR–58; 1988. 5 p.

Two equations are presented that estimate a maximum investment limit and working capital requirements for the FPL low-cost solar dry kiln systems. The equations require data for drying cycle time, green lumber cost, and kiln-dried lumber costs. Results are intended to provide a preliminary estimate.

46. Factors Affecting Residential Construction in the United States—Current Markets and Future Prospects

Marcin, Thomas C.; Hutton, Jay
In: Hamel, Margaret P., ed. North American wood/fiber supplies and markets: strategies for managing change: Proceedings 47351; 1986 October 2–4; Chicago. Madison, WI: Forest Prod. Res. Soc. 1987: 105–115.

This paper discusses current and future prospects for wood products consumption in the U.S. housing market. Alternative projections of housing demands are analyzed relative to long-term demographic and economic trends. Changes in housing size, the mix of housing types, and trends in wood products use per housing unit are examined.

47. New Panel Technologies and Their Potential Impact

Spelter, Henry
In: Hamel, Margaret P., ed. Structural wood composites: new technologies for expanding markets: Proceedings 47359; 1987 November 18–20; Memphis, TN. Madison, WI: Forest Prod. Res. Soc.; 1988: 136–141.

This paper discusses the potential impacts of technological change on typical mills in terms of mill capacity, costs, and profitability.

48. Plywood Mill Economics

Spelter, Henry
Plywood & Panel World. 1988 April–May: 18–20.

New technologies that promise to significantly improve plywood manufacturing are raising questions about the economic implications on mills. Using a simulation model called Plywood Mill Analysis Program (PLYMAP), this report analyzes the economic effects of technological change on a plywood mill in terms of impact on productivity, costs, and profits. PLYMAP was developed at the Forest Products Laboratory.

Wood Bonding Systems

49. New Technologies and Materials for Bonding Wood Products

Myers, George E.
Adhesives Age. October 1988: 31–36.

This paper examines the use of wood adhesives on wood panel production, which represents the major use of wood adhesives in the United States. It explains the general areas of research in progress to develop new wood adhesives from renewable resources and the new adhesive bonding technologies being used by the U.S. wood products industry.

50. An Acid-Catalyzed Phenolic Adhesive for Radiofrequency Laminating of Hardwood Composite Framing

Vick, Charles B.
Forest Prod. J. 38(11/12): 8–14; 1988.

This paper reports the working properties, strength, and durability of the acid-catalyzed phenolic molding resin when it is used to bond yellow-poplar and sweetgum veneer laminates to the edges of hardwood flakeboard cores (a mixture of both species), using radiofrequency heat for curing. Factors studied included veneer species, veneer and flakeboard moisture content, resin molecular weight, adhesive spread rate, and closed assembly time.

51. Adhesive Bonding of Acetylated Aspen Flakes, Part 2. Effects of Emulsifiers on Phenolic Resin Bonding

Youngquist, J.A.; Sachs, I.B.; Rowell, R.M.
Int. J. Adhesion and Adhesives 8(4): 197–200; October 1988.

The purpose of this research was to evaluate wettability of flakes in response to different emulsifiers; determine internal bond strength and percentage of wood glueline failure in small experimental flakeboards made with resin containing different emulsifiers; and determine modulus of rupture and modulus of elasticity of larger boards made with the best emulsifier determined by the internal bond test.

Special Items

Forest Products: World Outlook Projections

Food and Agriculture Organization of the United Nations
1988 FAO Forestry Paper 84. 350 p.

Forest Products: World Outlook Projections presents a country by country world view of the future demand for forest products and for timber—a useful tool in making country-level forestry development plans. The Forestry Department of the Food and Agriculture Organization (FAO) of the United Nations prepared this report with assistance from the Forest Products Laboratory.

This report projects consumption and production from 1987 to 2000 of several forest products reported in the FAO Yearbook of Forest Products. Products include sawnwood, wood-based panels, fiber input to paper, roundwood input to all modern sector products, and roundwood consumed for fuel. Individual sections group the information by country and by product, covering 160 countries. The FAO based these projections on data collected from 1961 to 1985 and econometric relationships that link consumption and production to economic variables such as gross domestic product, gross fixed capital investment, and population.

A limited number of copies of this report are available by writing the Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705–2398. When our supply is exhausted, you will be directed to order from Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy.

Proceedings of the 1988 International Conference on Timber Engineering

This 2-volume report presents the papers given at the 1988 International Conference on Timber Engineering held September 19–22, 1988, in Seattle, Washington. Papers authored or coauthored by Forest Products Laboratory employees include the following:

Analysis of Size Effect for Glulam Beams
Moody, Russell C.; Dedolph, Carter, Jr.; Plantinga, Pamela L.

Computer Programs for Structural Analysis of Wood Walls and Floors
McCutcheon, William J.

Contribution of Gypsum Wallboard to Racking Performance of Walls
Oliva, M.; Wolfe, R.W.

Creep of Small Glulam Beams Under Changing Relative Humidity Conditions
Srpcic, Jelena; Moody, Russell C.

Duration-of-Load Effect on Toothed Metal-Plate Connections
Soltis, Lawrence A.; Shea, Rodney M.

Effect of CCA Preservative Treatment and Redrying on Fracture Toughness of Loblolly Pine
Winandy, Jerrold E.; Kretschmann, David E.

Effect of Temperature on Duration of Load of Structural Lumber
Fridley, Kenneth J.; Tang, R.C.; Soltis, Lawrence A.

End Distance Effects Comparing Tensile and Compression Loads on Bolted Wood Connections
Patton-Mallory, Marcia

Evaluating Lumber Properties: Practical Concerns and Theoretical Restraints
Green, David W.; Evans, James W.

Exploring the Relationship Between Local Grain Angle and Initial Fracture in Lumber Subject to Tensile Load
Cramer, Steven M.; Stahl, Douglas C.; Fohrell, William B.; McDonald, Kent A.

Fire Endurance Model Validation by Unprotected Joist Floor Fire Testing
Schaffer, E.L.; White, R.H.; Woeste, F.E.

Fire Growth and Fire Endurance Modeling in the Forest Products Industry
LeVan, Susan L.; Glowinski, Robert W.

The Influence of Juvenile Wood on the Mechanical Properties of 2x4's Cut from Douglas-fir Plantations
Bendtsen, B. Alan; Plantinga, Pamela L.; Snellgrove, Thomas A.

Lateral Loading of Wood Frame Houses—Analysis and Performance
Moody, Russell C.; Schmidt, Richard J.

Modeling Roof Systems for Reliability Analysis
Cramer, Steven M.; Wolfe, Ronald W.; Peyrot, Alain

Performance Tests of Light-Frame Roof Assemblies
Wolfe, Ronald W.; LaBissoniere, Timothy; Cramer, Steven M.

Prediction of Diaphragm Displacement
Falk, Robert H.; Itani, Rafik Y.

Reliability Analysis of Ponding Collapse of Wood Flat Roofs
Zahn, John J.; Murphy, Joseph F.

Stress Laminated Timber Deck Bridges: Prototype Project
Oliva, Michael G.; Ritter, Michael; Dimakis, Al G.

Structural Composite Panel Performance Under Long-Term Load
Laufenberg, Theodore L.

Use of Acoustic Emission in Evaluating Failure Processes of Wood Products
Patton-Mallory, Marcia

Copies of this proceedings are available at a cost of $59 per 2-volume set by requesting from the Forest Products Research Society, 2801 Marshall Court, Madison, WI 53705.

Log Analysis Routine–User's Guide, IMPROVE System, Version 01/06/89

State and Private Forestry and Forest Products Laboratory, January 1989. 109 p.

Log Analysis Routine–User's Guide includes the software and instructions for running the first of the many routines within the IMPROVE System. IMPROVE (Integrated Mill Production and Recovery Options for Value and Efficiency) is a package of quick, easily understood and effective tools for measuring and improving the efficiency of sawmills, veneer mills, and plywood plants. Its data collection procedures and computer software combine several successful, existing, recovery improvement programs with the latest in technological and research developments.

Log Analysis is designed to help mill owners and operators collect, organize, and store data about logs. This information is useful when buying or selling logs, determining inventory, knowing what is processed over a period of time, and conducting an efficiency study. *Log Analysis* can also be used to calculate log volumes, scales, averages, overlength, and bucking accuracy. It is one routine within the IMPROVE Log Processing Program. *Log Analysis* is a companion routine to the Best Opening Face (BOF) Sawing Simulation Analysis Routine (Lumber Manufacturing Program) and several routines in the Veneer Manufacturing Program.

Information on software and documentation availability may be obtained by writing Stan Lunstrum, State & Private Forestry, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705-2398.

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